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PROBLEMS AND SOLUTIONS.

EDITED BY B. F. FINKEL AND R. P. BAKER.

PROBLEMS FOR SOLUTION.

ALGEBRA.

When this issue was made up no solution of 420 had been received.

424. Proposed by S. A. JOFFE, New York City.

Sum the series

$$\binom{n}{a} - \binom{n-1}{a}\binom{i}{1} + \binom{n-2}{a}\binom{i}{2} - \binom{n-3}{a}\binom{i}{3} + \cdots + (-1)^i \binom{n-i}{a},$$

and consider the cases $i = a$ and $i > a$.

425. Proposed by CLIFFORD N. MILLS, Brookings, S. D.

Solve for x and y the equations: $2^{x+y} = 6$ and $2^{x+1} = 3^y$.

GEOMETRY.

When this issue was made up solutions had been received for numbers 370, 430, 432–3, 447–8, 450–1. Please give attention to 427, 442, 446, 449.

452. Proposed by NATHAN ALTSHILLER, University of Washington.

Through a given point a secant is drawn that meets three given concurrent lines in the points A, B, C respectively. Determine the position of the secant by the condition $AB/BC = K$, K being given.

453. Proposed by CLIFFORD N. MILLS, South Dakota Agricultural College.

Prove geometrically the formulæ for $\sin 2\beta$, $\cos 2\beta$, $\sin 3\beta$, $\cos 3\beta$.

454. Proposed by LOUIS ROUILLION, Mechanics Institute, New York City.

Show how to construct an equilateral triangle with its vertices lying on three lines not equally spaced.

CALCULUS.

When this issue was made up solutions had been received for numbers 358–9, 361–2, 364, 371, 373. Please give attention to 332, 339, 340, 342, 348, 353, 360, 363.

374. Proposed by C. N. SCHMALL, New York City.

Show that, on a *Mercator's Chart*, a great circle of a sphere whose radius is r will be represented by a curve whose equation is of the form

$$c(e^{y/r} - e^{-(y/r)}) = 2 \sin\left(\frac{x}{r} + \theta\right).$$

(*Note.* See EISENHART'S *Differential Geometry*, § 46, pp. 107–108; OSGOOD'S *Calculus*, pp. 331–333, § 6.)

375. Proposed by V. M. SPUNAR, Chicago, Illinois.

Solve the differential equation,

$$x^2(a - bx)\frac{d^2y}{dx^2} - 2x(2a - bx)\frac{dy}{dx} + 2(3a - bx)y = 6a^2.$$